Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1852	((405/124,134) or (52/295,610,745. 21,79.9)).CCLS.	US-PGPUB; USPAT; USOCR	OR	OFF	2005/03/02 16:22
S1	1	("4993872").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2005/03/02 16:14
S2	649	(405/125,286).CCLS.	US-PGPUB; USPAT; USOCR	OR	OFF	2005/03/02 11:17
S3	12	("1778574" | "2413867" | "3779021" | "4067166" | "4993872").PN. OR ("5536113").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2005/03/02 12:03
S4	18	("1762343" | "3686873" | "4440527" | "4564316" | "4790690" | "4929125" | "4960349" | "4961673" | "5028172" | "5064313").PN. OR ("5456554").URPN.	US-PGPUB; USPAT; USOCR	OR	ON	2005/03/02 12:17
S5	1	("4797030").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2005/03/02 12:23
S6	1	("4854775").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2005/03/02 12:23

paving & drainage specialists

Concrete Reinforcement

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Introduction

Concrete is, by nature, a brittle material that performs well in compression, but is considerably less effective when in tension. Reinforcement in concrete is used to absorb these tensile forces so that the cracking which is inevitable in all high-strength concretes does not weaken the structure.

For many years, steel in the form or bars or mesh (also known as "re-bar") has been used as a reinforcement for concrete slabs that are designed to experience some form of loading, whether that loading would be carrying traffic, spanning a void or bearing another structure such as a wall. In many slabs, steel mesh has also been used as a cheap (and often ineffective) method of crack control.

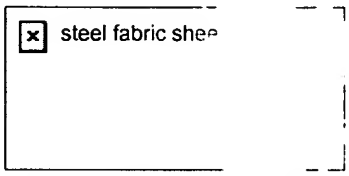
Latest developments in concrete technology now includes reinforcement in the form of fibres, notably polymeric fibres, as well as steel or glass fibres. Fibre-reinforcement is predominantly used for crack control and NOT structural strengthening.

Steel

Where steel reinforcement of a slab is required for structural reasons the specification will more than likely require high-tensile steel bars as well as fabric mesh and the design should be undertaken by a qualified engineer. Steel mesh comes in a wide array of profiles with varying mesh sizes and wire sizes as indicated in the table opposite.

Fabric Type [square mesh]	Mesh Size mm	Wire Ø mm	Mass per m2	No. of ... per T...
A98	200x200	5	1.54	5
A142	200x200	6	2.22	4
A193	200x200	7	3.02	2
A252	200x200	8	3.95	2
A393	200x200	9	6.16	1

Table 1 - Welded Steel Fabric for Pavemen



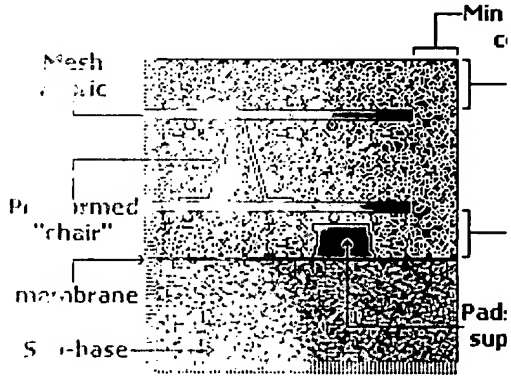
Typical steel fab... ...eet

Lapping of fabric ...ets

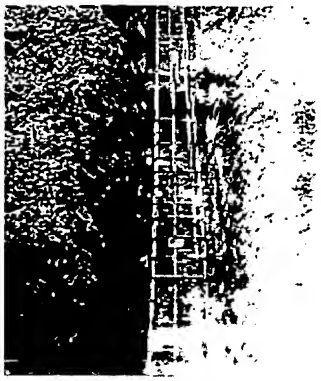
Typically, the mesh, also known as **'fabric'**, comes sheets measuring 4800mm x 2400mm which are to required size on site by means of a cut-off saw 'croppers'. Where sheets need to be overlapped, t lap should be at least 350mm and the two layers should be lashed together with tie-wire.

The most commonly specified steel fabrics for pav works are A142 (6mm wires), A193 (7mm wires) A252 (8mm wires). A142 mesh is often used in 100mm thick light-use slabs such as paths, drivev and garage bases, while A252 is normally associa with heavier-duty 150-200mm thick slabs, with A used in either. In light-use applications, a single l of fabric may be used, but in heavier jobs, two lay are used "top and bottom".

There must ALWAYS be a minimum of 50m cover over steel reinforcement, both above, below and around, as shown in the diagram opposite. The fabric is supported from beneath at regular intervals by padstones which are often broken pressed concrete flagstones, or "chairs", purpose-made plastic or steel supports. These supports are spaced roughly every 600mm or so, sufficient to carry the fabric without allowing it to sag unacceptably.



Cover for steel mesh



Steel in position ... groundbeam

As mentioned above, high-tensile steel bars are not normal used in pavement slabs unless there are extenuating circumstances, but are regularly used in ground beams and vertical structures. Bar steel is also commonly used in toed garage and house slabs or rafts where the building is to be constructed from brickwork: by keeping the slab in tension, steel helps prevent cantilevering forces of the brickwork cracking the slab.

Steel-fixing is a trade in itself and is currently beyond the r... of this web-site.

Fibres

While steel reinfor t is still widely used for structural works, the development of fi reinforcement ove t years has seen a shift away from the traditional steel mesh fc crack control in pla work. Special use concretes may be reinforced with steel or gl fibres, but, the most monly used fibre reinforcement is polymeric, usually polypropy or polyester.

It should be noted t ly-fibres are not a replacement for steel in structural concrete are of benefit in red the incidence of small cracks within the slab brought about by plastic shrinkage ar tlement during the curing process. They are often used in conjunction with st ric.

The fibres are usu ypropylene or polyester filaments and come on various lengths differing applicati s y are added to the mix while i s still in the drum at the rate o around 600-1000g of concrete. It is essential that the fibres are properly and thoroughly disperse oughout the mix and are not allowed to 'clump', creating fibre-f areas of concrete. dition of specialist welting agents will aid this process. Luckily us, the concrete ba nts can control all of these parameters and ensure a properly designed and mix ete is delivered to the site.

Along with improv ck control, the addition of fibres to a concrete mix has been sho to improve impac nce and hardness, reduce segr ation of aggregates and incid of bleeding during ring process, reduce permeabil y after curing and to offer bett frost and fire resis n the finished slab.

The fibres work by together" the concrete during placement, during the cure and after curing has be pleted.

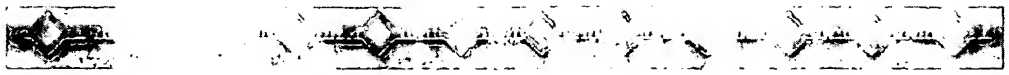
Placement bres help reduce segregation of the fines and the cement mediately following placement, thereby ensuring a more compe crete

Curing bres absorb most of the tensile forces caused by the natural inkage of the mix as it changes state from a freshly-placed liqu lly-cured solid.

In Servic nce the concrete has cured, the effort required to de-bond, stre /or break the fibres within th matrix by tensile forces effecti duce the incidence of surface c king and the inherent brittlen a concrete.

fibres in concrete

Many of today's hig -quality batch-mixed concrete will incorporate fi s of one type or another as th relatively low cost is more than justified by the ber brought about by t ir inclusion. Most ready-mixec concretes supplied r decorative concrete work re the fibre content to ieve the high-quality finish required for that ty or prestige paving.



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